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ON THE DISTRIBUTION AND PHENOLOGY OF *ARGYRODES FICTILIUM* (ARANEAE, THERIDIIDAE) AT ITS NORTHERN LIMIT OF NORTH AMERICA

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ABSTRACT. *Argyrodes fictilium* is a rarely collected species whose northern range was thought to be southern Canada. Recent collections in the eastern boreal forests of Québec extend its distribution range to the north and suggest that *A. fictilium* might be found anywhere within the boreal forest tree limit. Mature males collected in May indicate a summer-stenochronous type of phenology.

Keywords: Distribution, phenology, boreal, araneophagic

The genus *Argyrodes* Simon 1864 is known in Canada from three species easily recognizable as members of the genus by their unusual triangular abdomen (Exline & Levi 1962). These are *Argyrodes trigonum* (Hentz 1850), *A. cancellatus* (Hentz 1850) and *Argyrodes fictilium* (Hentz 1850). The elongated palpal tibia and femur of *A. fictilium* are peculiar, but the male and female genitalia leave no doubt about the species' identity nor its generic affinity. According to Exline & Levi (1962), this species is rare but ranges from southern Canada to Panama. In a recent revision of the Neotropical species of the genus, Gonzàlez & Castro (1996) confirmed the distributional pattern of *A. fictilium*, including its southern Canadian localities and its presence in South America with new records from Argentina.

We present new data concerning the distribution and phenology of *A. fictilium* at its northern limit and provide a new illustration of the male palp. The data (Table 1) used to build the distribution map and the phenology graph were gathered from three sources: literature, private and public collections, and our own collection. Genitalia of available specimens were studied with a Nikon SMZ-U, and Fig. 1 was done with a camera lucida and a hybrid technique of traditional line drawing with India Ink and computer drawing on Macintosh.

Males of almost all American species of the genus *Argyrodes*, except for *A. fictilium*, have a cephalic projection or protuberance which is characterized by an unmodified, rather flat cephalothorax (Exline & Levi 1962). The genitalia of Québec and Ontario specimens were studied (Fig. 1) and the specimens from Canada are identical to those occurring from the United States (Exline & Levi 1962) to Argentina, including Cuba and Jamaica (Gonzàlez & Castro 1996).

While the genus *Argyrodes* is well known for its peculiar kleptoparasitic feeding habits (Tanaka 1984; Whitehouse 1988, 1997), *A. fictilium* has been reported to prey on *Araneus* sp., *Frontinella communis* (Hentz 1850), *Philoponella oweni* (Chamberlin 1924), *Frontinella* sp. and an unidentified linyphiid (Archer 1946; Exline & Levi 1962; Trail 1981; W. Shear pers. comm.). Trail (1981) has suggested that large *Argyrodes* species prey on other spiders while smaller species are kleptoparasites, but Tanaka (1984) showed that small *Argyrodes* also prey on big spider species. Present knowledge suggests that all species studied so far in the *Rhomphaea* species group, including *A. fictilium*, are araneophagic rather than kleptoparasites (Archer 1940; Whitehouse 1987, pers. comm.).

The distribution map (Fig. 2) confirms the wide and scattered distribution of the species at its northern limit, with records from the eastern and western regions of Canada. In Exline & Levi (1962) and Gonzàlez & Castro (1996), the northern limit ''southern Canada'' referred to the records from Vancouver Island (British Columbia) and Lake Temagami (On-

Figure 1.—*Argyrodes fictilium* from Nouveau-Québec Territories (49°48′N, 78°54′W) Québec, palpus, ventral view.

tario). Some new records presented here show a much more northerly distribution than previously reported. In particular, the records of Paquin and Dupérré (Table 1) in the black spruce forest of eastern Canada and the one by Aitchison-Benell & Dondale (1992) in Manitoba extend the species' distribution to the boreal region.

Two hypotheses are formulated here concerning the distribution of *A. fictilium* in the boreal region, this species being of a Neotropical origin (Gonzàlez & Castro 1996). The first explains the northern distribution as the sporadic northern extension of a species usually confined to more southern latitudes. On a smaller geographical scale, the variability of environmental conditions such as temperature and moisture would allow its sporadic presence in more northern latitudes. The instability of such conditions would explain its rarity as well as the gaps in its distribution in the boreal area. An example of such a dynamic is given by *Neochlamisus comptoniae* (Brown) (Coleoptera, Chrysomelidae), an insect that is known to have a northern limit around the U.S. and Canada border (LeSage 1984) while its host plant, *Comptonia peregrina* (L.) Coulter, is present in northern Québec (Marie-Victorin 1964).

The second hypothesis states that the distribution of *A. fictilium* may also include the boreal region, which is delimited by the north-

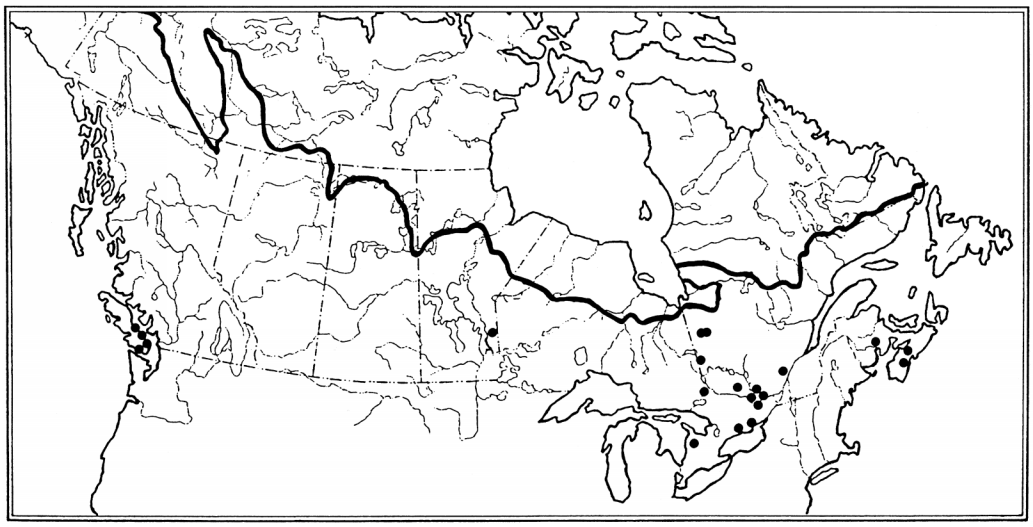

Figure 2.—Distribution of *Argyrodes fictilium* in Canada. The solid line shows the northern limit of the boreal forest.

Table 1.—Collection data from collections and literature. (CNC: Canada National Collection, DBC: Donald J. Buckle Collection, LLC: Laurent LeSage Collection, CPAD Pierre Paquin and Nadine Dupérré Collection).

Data source	Province and locality	Date of collection	Sex	Notes
From collections				
CNC	BRITISH COLUMBIA: Qualicum beach	23 May 1946	2 F	—
CNC	NOVA SCOTIA: Canard	05 Sept. 1956	M	Apple trees
CNC	ONTARIO: Odessa	04 July 1963	F	—
CNC	ONTARIO: Belleville (Field station)	09 June 1960	F	Pine
CNC	NEW BRUNSWICK: Fredericton	02–03 July 1969	F	Balsam fir
CNC	ONTARIO: Markdale	17 June 1988	F	Cedar fen beating
CNC	ONTARIO: Ottawa	03–09 July 1989	M	Damp acer/betula wood
DBC	NOVA SCOTIA: Mahone Bay	24 Sept. 1996	Juv.	Balsam fir
LLC	QUÉBEC: Pontiac, Lake Davis (N of Fort-Coulonge)	24 August 1991	Juv.	Mixed forest, beating
LLC	QUÉBEC: Pontiac; Lake Davis (N of Fort-Coulonge)	01 Sept. 1990	Juv.	Mixed forest, beating
CPAD	QUÉBEC: Nouveau-Québec Territories; 49°48′N, 78°54′W	06–13 July 1997	M	Burned Black spruce forest, flight interception trap
CPAD	QUÉBEC: Nouveau-Québec Territories; 49°48′N, 78°54′W	29 June–6 July 1997	M	Mature Black spruce forest, flight interception trap
CPAD	QUÉBEC: Abitibi; Lake Duparquet; 48°30′N, 79°13′W	24–30 June 1997	M	Mature Jackpine forest, soil emerging cage
From literature				
Emerton (1920)	QUÉBEC: Outaouais; Hull	—	—	—
Kurata (1943)	ONTARIO: Nipissing Co.; Lake Temagami	20 August 1937	F	—
Exline & Levi (1962)	ONTARIO: Nipissing Co.; Lake Temagami	—	—	—
	BRITISH COLUMBIA: Pender Harbour	—	—	—
	BRITISH COLUMBIA: Wellington	—	—	—
	BRITISH COLUMBIA: Nanaimo	—	—	—
Aitchison-Bennel & Dondale (1992)	MANITOBA: 51°30′N, 95°00′W (C4)	—	—	Boreal forest; decidous woods; tree foliage

Table 1.—Continued.

Data source	Province and locality	Date of collection	Sex	Notes
LeSage & Hutchinson (1992)	QUÉBEC: Maskinongé; St-Angèle	12 July 1990	Juv.	Mixed forest, beating
	QUÉBEC: Gatineau; Aylmer	08 Sept. 1990	Juv.	Maple-beech forest, beating
	QUÉBEC: Pontiac; Lake Davis (N of Fort-Coulonge)	01 Sept. 1990	Juv.	Mixed forest, beating
	QUÉBEC: Pontiac; Lake Davis (N of Fort-Coulonge)	30 Sept. 1990	6 Juv.	Mixed forest, beating

ern tree limit (Danks & Footitt 1989) (Fig. 2). This hypothesis partially relies on the records of Aitchison-Benell & Dondale (1992) from Manitoba, and Paquin and Dupérré (Table 1) from Québec, both from the boreal region but in two different ecological contexts. As mentioned by Scudder (1979), the boreal ecological zone forms a vast transcontinental belt and the largest continuous vegetation association in North America. This wide ecological zone is roughly divided into a southern and a northern part. The southern part (also called mixed-boreal) is dominated by deciduous (aspen and birch) and coniferous forest (white spruce, balsam fir, and white cedar) while the northern part is mainly dominated by black spruce (Grandtner 1966; Rowe 1972). In eastern Canada, the boreal belt is under the strong climatic influence of Hudson and James Bays. In this area, northern conditions are met at a lower latitude than anywhere else in the country (Danks 1979). This distribution pattern is shown by the black spruce distribution across Canada (Rowes 1972).

Very little is known about the biological traits of *A. fictilium* and its ecological preferences. Its distribution pattern might, however, reflect a wide range of potential prey rather than a limited distribution of a specific host. The known prey of *A. fictilium* are likely to find suitable web substrate everywhere within the tree limit; and the records of *A. fictilium* indicate an association with forest habitats, particularly coniferous forest (Table 1). This suggests that food would not be a limiting factor. Other abiotic factors that might limit its northern distribution are largely unknown.

There is little evidence to favor either of the two hypotheses for the distribution of *A. fictilium*. Nevertheless, the hypothesis for a distribution that covers the boreal area rather then a sporadic extension seems to be better supported when the records from Québec are considered. Even though the record of *A. fictilium* from Manitoba is the most northern for the species in regards to the latitude, it does not indicate an extension of the species range into the northern boreal region because it is reported from the mixed-boreal forest. However, the records from the black spruce forest of Québec allow such a range extension into the northern boreal area. Despite the lower latitudes of the localities, these records come from an ecological zone that is more representative of northern conditions as shown by the vegetation belt and climatic data (Danks 1979). The presence of *A. fictilium* in the black spruce forests of Québec clearly indicate that the species occurs in the northern boreal area; and, according to the second hypothesis, its presence can be expected throughout this wide ecological region.

Figure 3 shows periods of collection for the known Canadian specimens of *A. fictilium*. Mature females are active from the end of May until the beginning of July while males seem to appear later in the season, from the end of June until September. Juveniles are mainly reported in September, and we assume these to be the overwintering stages. According to Tretzel (1954) there are three types of phenology: 1) stenochronous where adults are present in a definite period of the year, 2) eurychronous where adults are present all year long (with or without a definite reproduction period), and 3) winter-mature. The male peak of abundance is considered to be the indicator of the maturation period. Aitchison (1984),

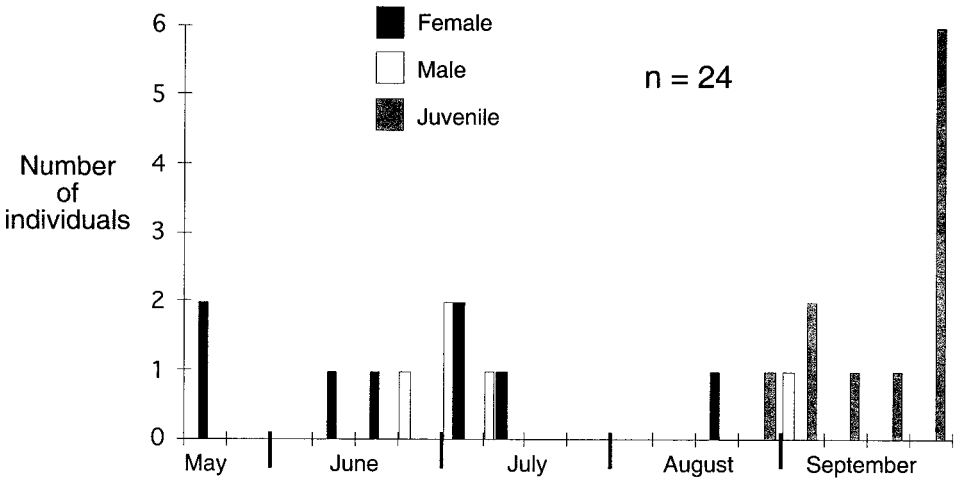

Figure 3.—Seasonal distribution of immature, male, and female of *Argyrodes fictilium* in Canada.

however, refined that terminology by dividing the stenochronous type into three classes: spring-, summer- and autumn-stenochronous. Despite the fact that it is difficult to confirm a phenological type with so few specimens, the summer-stenochronous class fits our data, mature males being collected mainly in July.

Argyrodes fictilium is a rare species within its northern limits and it is difficult to study its biology. Only 30 specimens are known from Canada, most of them from Québec and Ontario where the collection intensity may have been higher than in other parts of the country. It is also difficult to see a clear pattern in its distribution because of the rarity of the species and the lack of collections. However, the present state of knowledge allows a hypothesis that may link the forested portion of the territory to its distribution, including the boreal forest. It is surprising to see a species with such wide range of habitat occurring from South America to the boreal forest. Future collections, especially in poorly studied regions such as the northern boreal forest in central and western part of Canada, are likely to yield more specimens and confirm its phenology and distributional pattern.

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